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(54) PHOTOCATALYTIC FIBER AND ITS PRODUCTION

(57)Abstract:

PURPOSE: To allow a photocatalytic fiber to exhibit photocatalytic action even in a place hardly exposed to light by carrying a photocatalyst on an optical fiber having a light leaking part and to enhance the efficiency of utilization of the photocatalyst.

CONSTITUTION: An aq. dispersion of a photocatalyst is applied to the surface of an optical fiber and the photocatalyst is fixed. That is, photocatalyst powder is dispersed in a resin soln. prepd. by dissolving epoxy resin, acrylic resin or styrene resin in an org. solvent, a soln. of a silane coupling agent or water glass, the resultant liq. is applied to the surface of an optical fiber and the powder is fixed by polymn. curing or by evaporating the liq. by heating. The polymn. curing is carried out by a heating reaction or irradiation with active energy such as UV rays. A commercially available titanium dioxide or zirconium oxide sol may be used as the aq. dispersion. The objective photocatalytic fiber may be produced by applying a partial hydrolyzate of an organometallic compd. to the surface of an optical fiber and fixing it by condensation reaction.

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(54)【発明の名称】　光触媒繊維及びその製造法

(57)【要約】

【目的】　光触媒の利用効率を向上させた光触媒繊維を提供する。

【構成】　漏光部を有する光学繊維に光触媒が担持されてなる光触媒繊維、及び、予め漏光部を形成した光学繊維に光触媒を固着させるか、或いは光学繊維に光触媒を固着させた後漏光部を形成して光触媒繊維を製造する方法。

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【特許請求の範囲】

【請求項１】　漏光部を有する光学繊維に光触媒が担持されてなる光触媒繊維。

【請求項２】　予め漏光部を形成した光学繊維表面に光触媒を分散させた接着性を有する液体を塗布し、固着させるか、或いは光学繊維表面に該液体を塗布し、固着させた後漏光部を形成することを特徴とする光触媒繊維の製造法。

【請求項３】　予め漏光部を形成した光学繊維表面に光触媒の水分散液を塗布し、固着させるか、或いは光学繊維表面に該水分散液を塗布し、固着させた後漏光部を形成することを特徴とする光触媒繊維の製造法。

【請求項４】　予め漏光部を形成した光学繊維表面に有機金属化合物の部分加水分解物を塗布し、次いで該加水分解物を縮合させ、生成する光触媒を固着させるか、或いは光学繊維表面に該加水分解物を塗布し、縮合させ、生成する光触媒を固着させた後漏光部を形成することを特徴とする光触媒繊維の製造法。

【請求項５】　予め漏光部を形成した光学繊維表面に気相蒸着法により光触媒を堆積させ固着させるか、或いは光学繊維表面に気相蒸着法により光触媒を堆積させ固着させた後漏光部を形成することを特徴とする光触媒繊維の製造法。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、光での化学反応及び分解に用いる光触媒繊維及びその製造法に関する。

【０００２】

【従来の技術】従来より、酸化チタンを光触媒として水を光分解することは、「ホンダ・フジシマ効果」として公知であり、その応用として、タイル面やガラス面に酸化チタンを塗布し、水と光の存在下で菌や付着汚れを分解させる抗菌性タイル、汚れの消えるガラスが開発されている。また、水の浄化として、例えば特開平４－２４４２９号公報では、二酸化チタン粉末を光触媒として用い廃水中の有機物質を接触酸化分解することも知られ、光での化学反応及び分解の利用は、従来より種々行われている。

【０００３】しかしながら、光は、その特性の直進性から光の照射されない部分が生じ易く、特に光触媒との組み合わせにおいては、触媒効率の低いことが大きな欠点になっている。また、光触媒が粉末であるときは、粉末触媒の回収に多大なエネルギーを要する等の問題がある。

【０００４】

【発明が解決しようとする課題】本発明は、光が届き難いところでも、光触媒作用を発揮させるべく検討の結果なされたもので、本発明の目的は、光触媒の利用効率を向上させた光触媒繊維を提供することにある。

【０００５】

【課題を解決するための手段】本発明の要旨は、漏光部を有する光学繊維に光触媒が担持されてなる光触媒繊維、及び、予め漏光部を形成した光学繊維に光触媒を固着させるか、或いは光学繊維に光触媒を固着させた後漏光部を形成することからなる光触媒繊維の製造法にある。

【０００６】本発明の光触媒繊維において、基体繊維としての光学繊維は、異なる屈折率の組み合わせ構造を有し、繊維内部を光が透過する光学繊維で、石英で代表される無機系光学繊維、アクリル樹脂、ポリスチレン樹脂、ポリカーボネート樹脂、非晶質ポリオレフィン樹脂、シリコン樹脂等の有機系光学繊維が挙げられる。

【０００７】本発明の光触媒繊維においては、光触媒を担持する光学繊維は、漏光部を有することが必要であり、繊維表面に傷を付けて漏光部を形成する、繊維を曲げて繊維表面に漏光部を形成する等の方法によって繊維表面に多数の漏光部が形成されている。

【０００８】かかる漏光部を有する光学繊維に担持される光触媒としては、例えば二酸化チタン、酸化亜鉛、三酸化タングステン、酸化ニオブ、酸化ジルコニウム、酸化セリウム、二酸化珪素等の金属酸化物や硫化亜鉛、硫化銅、硫化カドミウム等の金属硫化物が挙げられる。

【０００９】本発明の光触媒繊維は、基体繊維が光学繊維であることから、可撓性を有し、金属製の不透明な容器内部、また、光が通り難い、濃く着色した液体或いは濁った液体中でも、また加圧の条件下でも、外部から光触媒繊維内に光を通して、光触媒作用により化学反応及び分解を行わせる。例えば本発明の光触媒繊維を用いるならば、水底のヘドロの分解もできる。

【００１０】また、光触媒繊維は、複数本がそのままの状態或いは束ねられた若しくは並べられた形態であってもよいが、触媒面積を広くする点からは、光の入射部分が束状若しくはテープ状の形態で、各繊維の漏光部が拘束を受けない状態で用いることが好ましい。

【００１１】本発明の光触媒繊維は、太陽光、紫外線等の光反応に用いる光を漏光部より取り出し、本来直進性の光が当たらない或いは当てることが困難な対象まで光を当てることができ、また、光触媒性能として、繊維状を呈することから触媒として活性な面積が広く、触媒存在部分に光が当たることから光触媒の利用効率が高く、さらに、繊維としての可撓性を有することから、広い対象に適用できる。

【００１２】本発明の光触媒繊維は、以下のような方法にて製造される。

（１）光学繊維表面に光触媒を分散させた接着性を有する液体を塗布し、固着させる方法。より詳しく述べると、エポキシ樹脂、アクリル樹脂若しくはスチレン樹脂等を有機溶媒に溶解した樹脂液、シランカップリング剤液、水ガラス等に光触媒粉末を分散させた液体を光学繊維表面に塗布し、重合硬化または液体を加熱して蒸発さ

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せ固着させる。重合硬化は、加熱反応により、また紫外線等活性エネルギーの照射により行うことができる。

【0013】（2）光学繊維表面に光触媒の水分散液を塗布し、固着させる方法。より詳しく述べると、光触媒粉末を水に分散させた光触媒水分散液を光学繊維表面に塗布し、加熱乾燥により水を蒸発させて固着させる。光触媒水分散液としては、市販の二酸化チタンゾル液、酸化ジルコニウムゾル液等を用いることができる。

【0014】（3）光学繊維表面に有機金属化合物の部分加水分解物を塗布し、次いで該加水分解物を縮合させ、生成する光触媒を固着させる方法。より詳しく述べると、有機金属化合物としては、チタンテトライソプロポキシド、タングステン酸アンモニウムパラ五水和物、五塩化ニオブ、チタンテトラメトキシド、チタンテトラエトキシド等が挙げられ、部分加水分解及び縮合反応は、25～800℃程度の範囲での加熱により行うことが望ましい。

【0015】（4）光学繊維表面に気相蒸着法により光触媒を堆積させ固着させる方法。より詳しく述べると、スパッタリング法、イオンプレーティング法等の気相蒸着法により、光触媒を光学繊維表面に堆積させ固着させる。スパッタリング法、イオンプレーティング法を用いる場合は、ターゲットとして光触媒作用を有する化合物は純度95%以上の高純度化合物を用いることが望ましく、純度が低いと、堆積物が光触媒作用を発現しにくい。市販のターゲット材料としては、二酸化チタン、三酸化タングステン、酸化セリウム、硫化亜鉛等が挙げられる。

【0016】しかして、本発明の光触媒繊維を製造する方法においては、光学繊維として予め漏光部を形成した光学繊維を用いるか、或いは光触媒を固着させた後に光学繊維に漏光部を形成する。漏光部の形成は、既に述べたように、光学繊維表面に傷を付けて漏光部を形成する、光学繊維を曲げて曲部の外側の繊維表面に漏光部を形成する等の方法により行われる。光触媒固着後に漏光部を形成する場合は、光触媒固着光学繊維を曲げることにより曲部外側の繊維表面に漏光部を形成する方法が好ましく用いられるが、曲げの際に光触媒が剥離しないように、固着手段、曲げ手段を適宜選択する。

【0017】光触媒繊維の製造に際して、光学繊維の形態は、束状、テープ状等任意の形態であってもよく、従い、光触媒繊維の形態も適用用途に応じた任意の形態の光触媒繊維とすることができる。また、用いる光学繊維の長さは、通す光の減衰率、光触媒量等を考慮して決められ、反応、分解させる対象に応じ任意の長さとし得る。

【0018】

【実施例】以下、本発明を実施例により具体的に説明する。

【0019】（実施例1）石英系光学繊維の繊維表面に所定の長さにわたって#2000サンドペーパーで微細な傷を付けて多数の漏光部を形成した後、二酸化チタン粉末を分散させた水ガラスを塗布し、加熱焼結させ固着させて光触媒繊維を作製した。得られた光触媒繊維をトリクロロエチレン希薄水溶液に浸漬し、光触媒繊維の端部から太陽光を導光させたところ、トリクロロエチレンはごく短時間に殆ど分解された。

【0020】（実施例2）ポリメチルメタクリレート製光学繊維に二酸化チタン粉末を分散させた低分子量ポリメチルメタクリレートのメチルエチルケトン溶液を塗布し、50℃で乾燥し、二酸化チタンを固着させた。その後、この光触媒固着繊維に撚をかけて曲げ半径の小さな曲げを与えて漏光部を形成し、光触媒繊維を作製した。得られた光触媒繊維を4－クロロフェノール溶液に浸漬し、光触媒繊維の端部から400W水銀灯の光を導光させたところ、4－クロロフェノールはごく短時間にほぼ完全に分解された。

【0021】（実施例3）石英系光学繊維の繊維表面に#2000サンドペーパーで微細な傷を付けて多数の漏光部を形成した後、二酸化チタン粉末を分散させたポリアクリロニトリル系ポリマーのジメチルアセトアミド溶液を塗布、水で凝固させ固着させて光触媒繊維を作製した。得られた光触媒繊維をトリクロロエチレン希薄水溶液に浸漬し、光触媒繊維の端部から400W水銀灯の光を導光させたところ、トリクロロエチレンはごく短時間に完全に分解された。

【0022】（実施例4）石英系光学繊維の繊維表面に#2000サンドペーパーで微細な傷を付けて多数の漏光部を形成した後、二酸化チタン70wt%／二酸化珪素30wt%の混合粉末を分散させた水ガラスを塗布し、加熱焼結させ固着させて光触媒繊維を作製した。得られた光触媒繊維をサリチル酸希薄水溶液に浸漬し、光触媒繊維の端部から太陽光を導光させたところ、サリチル酸はごく短時間にほぼ完全に分解された。

【0023】（実施例5）石英系光学繊維の繊維表面に#2000サンドペーパーで微細な傷を付けて多数の漏光部を形成した後、光触媒水分散液として市販の二酸化チタンゾル液（多木化学社製）に浸漬して塗布し、50℃で加熱焼結させ固着させて光触媒繊維を作製した。得られた光触媒繊維をクロロフェノール希薄水溶液に浸漬し、光触媒繊維の端部から太陽光を導光させたところ、クロロフェノールはごく短時間にほぼ完全に分解された。

【0024】（実施例6）石英系光学繊維の繊維表面に#2000サンドペーパーで微細な傷を付けて多数の漏光部を形成した後、チタンテトライソプロポキシドを10wt%含むイソプロピルアルコール溶液に浸漬して塗布し、100℃で乾燥し、600℃で加熱焼結させ固着させて光触媒繊維を作製した。得られた光触媒繊維をサリチル酸希薄水溶液に浸漬し、光触媒繊維の端部から太

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陽光を導光させたところ、サリチル酸はごく短時間にほぼ完全に分解された。

【００２５】（実施例７）石英系光学繊維の繊維表面に＃２０００サンドペーパーで微細な傷を付けて多数の漏光部を形成した後、ＲＦスパッタリングチャンバー内に置き、10^{-5}ｔｏｒｒ雰囲気下、１３．５６ＭＨｚの周波数でスパッタリング法により繊維表面に二酸化チタン薄膜（膜厚１．５μｍ）を形成させて光触媒繊維を作製した。得られた光触媒繊維を４－クロロフェノール希薄水溶液に浸漬し、光触媒繊維の端部から４００Ｗ水銀灯の光を導光させたところ、４－クロロフェノールはごく短時間に完全に分解された。

【００２６】

【発明の効果】本発明の光触媒繊維は、光が直接届き難い領域へ光を導くと共に光触媒を存在させ、また光触媒が繊維状物に担持され触媒面積が広いことにより、光触媒の利用効率が高く、さらに、光での化学反応及び分解を用いる広い対象に適用でき、特に汚れ、有害物質の分解、浄化、加圧下での反応、分解に有用である。

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the photocatalyst fiber used for the chemical reaction in light, and decomposition, and its manufacturing method.
[0002]
[Description of the Prior Art] It is well-known as the "Honda-Fujishima effect" to photodissociate water by using titanium oxide as a photocatalyst conventionally, as the application, titanium oxide is applied to a tile side or a glass side, and water, the antibacterial tile into which a bacillus and adhesion dirt are made to disassemble under existence of light, and the glass with which dirt disappears are developed. Moreover, as water purification, by JP,4-24429,A, understanding the organic substance in waste water by catalytic oxidation, using titanium-dioxide powder as a photocatalyst is also known, and the chemical reaction in light and use of decomposition are performed variously conventionally.
[0003] However, the part by which light is not irradiated tends to produce light from the rectilinear-propagation nature of the property, and it has become a big fault especially in combination with a photocatalyst that catalyst effectiveness is low. Moreover, when a photocatalyst is powder, there are problems, like recovery of a powder catalyst takes great energy.
[0004]
[Problem(s) to be Solved by the Invention] This invention was made as a result of examination so that it might demonstrate a photocatalyst operation even place [which light cannot reach easily], and the purpose of this invention is to offer the photocatalyst fiber which raised the use effectiveness of a photocatalyst.
[0005]
[Means for Solving the Problem] The summary of this invention is in the manufacturing method of the photocatalyst fiber for which the optical fiber which has a leaking part comes to support a photocatalyst, and the photocatalyst fiber which consists of forming the back leaking part which made the optical fiber which formed the leaking part beforehand fix a photocatalyst, or made the optical fiber fix a photocatalyst.
[0006] In the photocatalyst fiber of this invention, the optical fiber as base fiber has the combination structure of a different refractive index, it is the optical fiber with which light penetrates the interior of fiber, and organic system optical fibers, such as the inorganic system optical fiber represented with a quartz, acrylic resin, polystyrene resin, polycarbonate resin, amorphous polyolefin resin, and silicon resin, are mentioned.
[0007] In the photocatalyst fiber of this invention, the optical fiber which supports a photocatalyst needs to have a leaking part, the fiber which attaches a blemish to a fiber front face and forms a leaking part in it is bent, and many leaking parts are formed in the fiber front face by the approach of forming a leaking part in a fiber front face.
[0008] As a photocatalyst supported by the optical fiber which has this leaking part, metallic sulfide, such as metallic oxides, such as a titanium dioxide, a zinc oxide, a tungstic trioxide, niobium oxide, a zirconium dioxide, cerium oxide, and a silicon dioxide, zinc sulfide, copper sulfide, and a cadmium sulfide, is mentioned, for example.
[0009] Since base fiber is an optical fiber, the photocatalyst fiber of this invention lets light pass in photocatalyst fiber from the exterior, and makes a photocatalyst operation perform a chemical reaction and decomposition also under the conditions of pressurization also in the liquid colored deeply or the muddy liquid along which has flexibility and the metal opaque interior of a container and light cannot pass easily. For example, if the photocatalyst fiber of this invention is used, decomposition of the sludge of a sea bed can also be performed.
[0010] Moreover, although two or more may be a condition as it is or the gestalt put in order or it was bundled, from the point which makes catalyst area large, the incidence part of light is the gestalt of the shape of the shape of a bundle, and a tape, and, as for photocatalyst fiber, it is desirable to use in the condition that the leaking part of each fiber does not receive constraint.
[0011] The photocatalyst fiber of this invention can take out the light used for photoreaction, such as sunlight and

ultraviolet rays, from a leaking part, and guessing, or the light of rectilinear-propagation nature originally does not hit can apply light to a difficult object. As light catalytic ability Since it presents fibrous, an area [activity / as a catalyst] is large, since light is equivalent to a catalyst existence part, the use effectiveness of a photocatalyst is high, and it can apply to a large object from having the flexibility as fiber further.

[0012] The photocatalyst fiber of this invention is manufactured by the following approaches.

(1) How to apply the liquid which has the adhesive property which made the optical-fiber front face distribute a photocatalyst, and make it fix. When it states in more detail, the liquid which made the resin liquid which dissolved an epoxy resin, acrylic resin, or styrene resin in the organic solvent, silane coupling agent liquid, water glass, etc. distribute photocatalyst powder is applied to an optical-fiber front face, polymerization hardening or a liquid is heated, and is evaporated, and it is made to fix. The exposure of activity energy, such as ultraviolet rays, can perform polymerization hardening by the pyrogenetic reaction again.

[0013] (2) How to apply the water dispersion of a photocatalyst to an optical-fiber front face, and make it fix. When it states in more detail, the photocatalyst water dispersion which made water distribute photocatalyst powder is applied to an optical-fiber front face, water is evaporated by stoving, and it is made to fix. As a photocatalyst water dispersion, commercial titanium-dioxide sol liquid, zirconium dioxide sol liquid, etc. can be used.

[0014] (3) How to make the photocatalyst which applies the partial hydrolysate of an organometallic compound to an optical-fiber front face, is subsequently made to carry out condensation of this hydrolyzate, and is generated fix. When it states in more detail, as an organometallic compound, titanium tetraisopropoxide, tungstic-acid AMMONIUMUPARA 5 hydrate, 5 chlorination niobium, a titanium tetra-methoxide, titanium tetra-ethoxide, etc. are mentioned, and, as for partial hydrolysis and a condensation reaction, it is desirable to carry out with heating in the range of about 25-800 degrees C.

[0015] (4) How to make deposit a photocatalyst on an optical-fiber front face with gaseous-phase vacuum deposition, and make it fix. When it states in more detail, a photocatalyst is made to deposit on an optical-fiber front face, and is made to fix with gaseous-phase vacuum deposition, such as the sputtering method and the ion plating method. If it is desirable to use the high grade compound of 95% or more of purity as for the compound which has a photocatalyst operation as a target and purity is low when using the sputtering method and the ion plating method, a deposit cannot discover a photocatalyst operation easily. As a commercial target ingredient, a titanium dioxide, a tungstic trioxide, cerium oxide, zinc sulfide, etc. are mentioned.

[0016] A deer is carried out, and in the approach of manufacturing the photocatalyst fiber of this invention, a leaking part is formed in an optical fiber, after making a photocatalyst fix using the optical fiber which formed the leaking part beforehand as an optical fiber. As already stated, formation of a leaking part bends the optical fiber which attaches a blemish to an optical-fiber front face, and forms a leaking part in it, and is performed by the approach of forming a leaking part in the fiber front face of the outside of the pars convoluta lobuli corticalis renis. When forming a leaking part after photocatalyst fixing, the approach of forming a leaking part in the fiber front face of a pars-convoluta-lobuli-corticalis-renis outside by bending a photocatalyst fixing optical fiber is used preferably, but a means for detachable and a bending means are suitably chosen so that a photocatalyst may not exfoliate in the case of bending.

[0017] On the occasion of manufacture of photocatalyst fiber, the shape of the shape of a bundle and a tape etc. may be the gestalt of arbitration, and the gestalt of an optical fiber can follow and can also make the gestalt of photocatalyst fiber the photocatalyst fiber of the gestalt of the arbitration according to an application application. Moreover, the die length of the optical fiber to be used is decided in consideration of the attenuation factor of the light which it lets pass, the amount of photocatalysts, etc., and can be made into the die length of arbitration according to the object made to react and decompose.

[0018]

[Example] Hereafter, an example explains this invention concretely.

[0019] (Example 1) After attaching the detailed blemish to the fiber front face of a quartz system optical fiber with #2000 sandpaper covering predetermined die length and forming many leaking parts in it, apply the water glass which distributed titanium-dioxide powder, carried out heating sintering, it was made to fix, and photocatalyst fiber was produced. When the obtained photocatalyst fiber was immersed in the trichloroethylene thin water solution and the light guide of the sunlight was carried out from the edge of photocatalyst fiber, the trichloroethylene was almost decomposed very much for a short time.

[0020] (Example 2) The methyl-ethyl-ketone solution of the low-molecular-weight polymethylmethacrylate which made the optical fiber made from polymethylmethacrylate distribute titanium-dioxide powder was applied, it dried at 50 degrees C, and the titanium dioxide was made to fix. Then, bending with small bend radii was given having applied ** to this photocatalyst fixing fiber, the leaking part was formed, and photocatalyst fiber was produced. When the obtained photocatalyst fiber was immersed in 4-chlorophenol solution and the light guide of the light of 400W mercury-vapor lamp was carried out from the edge of photocatalyst fiber, 4-chlorophenol was disassembled very much for a short time

nearly completely.
[0021] (Example 3) After attaching the detailed blemish to the fiber front face of a quartz system optical fiber with #2000 sandpaper and forming many leaking parts in it, made the dimethylacetamide solution of the polyacrylonitrile system polymer which distributed titanium-dioxide powder solidify with spreading and water, it was made to fix, and photocatalyst fiber was produced. When the obtained photocatalyst fiber was immersed in the trichloroethylene thin water solution and the light guide of the light of 400W mercury-vapor lamp was carried out from the edge of photocatalyst fiber, the trichloroethylene was decomposed very much for a short time completely.
[0022] (Example 4) After attaching the detailed blemish to the fiber front face of a quartz system optical fiber with #2000 sandpaper and forming many leaking parts in it, apply the water glass which distributed mixed powder (titanium-dioxide 70wt%/silicon dioxide 30wt%), carried out heating sintering, it was made to fix, and photocatalyst fiber was produced. When the obtained photocatalyst fiber was immersed in the salicylic-acid thin water solution and the light guide of the sunlight was carried out from the edge of photocatalyst fiber, the salicylic acid was disassembled very much for a short time nearly completely.
[0023] (Example 5) After attaching the detailed blemish to the fiber front face of a quartz system optical fiber with #2000 sandpaper and forming many leaking parts in it, immerse and apply to commercial titanium-dioxide sol liquid (Taki Chemical Co., Ltd. make) as a photocatalyst water dispersion, carried out heating sintering at 50 degrees C, it was made to fix, and photocatalyst fiber was produced. When the obtained photocatalyst fiber was immersed in the chlorophenol thin water solution and the light guide of the sunlight was carried out from the edge of photocatalyst fiber, chlorophenol was disassembled very much for a short time nearly completely.
[0024] (Example 6) titanium tetraisopropoxide after attaching a detailed blemish to the fiber front face of a quartz system optical fiber with #2000 sandpaper and forming many leaking parts in it -- 10wt(s)% -- immerse and apply to the included isopropyl alcohol solution, dry at 100 degrees C, carried out heating sintering at 600 degrees C, it was made to fix, and photocatalyst fiber was produced. When the obtained photocatalyst fiber was immersed in the salicylic-acid thin water solution and the light guide of the sunlight was carried out from the edge of photocatalyst fiber, the salicylic acid was disassembled very much for a short time nearly completely.
[0025] (Example 7) After attaching the detailed blemish to the fiber front face of a quartz system optical fiber with #2000 sandpaper and forming many leaking parts in it, it placed into RF sputtering chamber, and under the 10-5torr ambient atmosphere, the titanium-dioxide thin film (1.5 micrometers of thickness) was made to form in a fiber front face by the sputtering method on the frequency of 13.56MHz, and photocatalyst fiber was produced. When the obtained photocatalyst fiber was immersed in 4-chlorophenol thin water solution and the light guide of the light of 400W mercury-vapor lamp was carried out from the edge of photocatalyst fiber, 4-chlorophenol was disassembled very much for a short time completely.
[0026]
[Effect of the Invention] While light leads light to the field which cannot arrive easily directly, a photocatalyst is made to exist, and a photocatalyst is supported by the fibrous object, and according to catalyst area being large, the photocatalyst fiber of this invention has the high use effectiveness of a photocatalyst, can be further applied to the large object using the chemical reaction in light, and decomposition, and is especially useful to the reaction under disassembly of dirt and harmful matter, purification, and pressurization, and decomposition.

[Translation done.]